COURSE SPECIFICATION

Course code	full-time programme:	**M#2-S2-ME-EM-209**
	part-time programme:	
Course title in Polish	**Powłoki w inżynierii mechanicznej**	
Course title in English	**Coatings for Mechanical Engineering Applications**	
Valid from (academic year)	**2024/2025**	

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**second-cycle**
Type of education	**academic**
Mode of study	**full-time programme**
Specialism	**Machine Operation and Maintenance**
Department responsible	**Department of Maintenance, Laser and Nanoscaleechnologies**
Course leader	**dr hab. inż. Norbert Radek, prof. PŚk**
Approved by	**dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering**

COURSE OVERVIEW

Course type		**specialism-related**
Course status		**compulsory**
Language of instruction		**English**
Semester of delivery	full-time programme	**Semester II**
	part-time programme	**Semester II**
Pre-requisites		
Examination required (YES/NO)		**YES**
ECTS value		**2**

Mode of instruction		**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	full-time programme	**15**		**15**		
	part-time programme					

LEARNING OUTCOMES

Category of outcome	Outcome code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Has a comprehensive knowledge of selected issues in the assessment of performance and wear properties of coatings used in mechanical engineering technologies.	MiBM2_W07
	W02	Has a detailed and theoretically supported knowledge of surface engineering and tribological research.	MiBM2_W11
Skills	U01	Is able to perform measurements and tests of coatings produced using various technologies, is able to interpret the obtained results and draw conclusions.	MiBM2_U10
	U02	Has the ability to select suitable engineering materials for the manufacture of coatings to ensure the correct operation of a machine or technical system in various areas of mechanics and mechanical engineering taking into account multivariate.	MiBM2_U12
	U03	Is able to carry out complex tasks in order to improve his/her professional competence. Has the ability to plan continuous self-education and to guide others in doing so.	MiBM2_U16
Competence	K01	Is aware of the need to independently supplement and expand knowledge in the field of mechanics and machine construction Is ready to critically evaluate the knowledge they possess, the importance of knowledge in solving cognitive and practical problems and the need to acquire new information both from literature and from experts in the field of mechanics and machine construction. Understands the need and knows the possibilities of continuous improvement (third-cycle studies, postgraduate studies, courses) aimed at improving professional, personal and social competences.	MiBM2_K01
	K02	Is ready to responsibly perform professional roles related to the field of study of mechanics and machine construction, adhere to ethical principles and work to ensure compliance with these principles, taking into account changing social needs, cares about the achievements, ethos and traditions of the profession. Adheres to the principles of professional ethics and takes action to ensure their compliance.	MiBM2_K05

COURSE CONTENT

Mode of instruction	Topics covered

lecture	Surface layer in the construction and operation of technical objects. Coating and its structure, types of coatings, operational properties of coatings. Abrasive blasting. Paint coatings. Modern surface engineering technologies, CVD coatings, PVD coatings, coatings produced by laser and electro-erosion. Coatings applied by thermal spraying methods. Application and role of modern coating technologies in mechanical engineering.
laboratory	Thickness measurements of operational coatings. The influence of abrasive blasting parameters on the geometric structure of the surface (SGP). Phenomena occurring in the microstructure of plasma-sprayed coatings after laser processing. The influence of current parameters on the roughness of spark-ignition coatings. Microhardness measurements of anti-wear coatings. Assessing the abrasion of laser-surfaced coatings. Friction resistance tests of laser-textured PVD coatings.

ASSESSMENT METHODS

Outcome code	Methods of assessment					
	Oral examination	Written examination	Test	Project	Report	Other
W01	X		X			
W02	X		X			
U01			X		X	
U02			X		X	
U03			X		X	
K01						X
K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	Obtaining at least 50% points in the oral answer.
laboratory	non-examination assessment	Obtaining at least 50% of points in the final test. Reports prepared and accepted.

OVERALL STUDENT WORKLOAD

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
		L	C	Lb	P	S	L	C	Lb	P	S	
1.	Scheduled contact hours	**15**		**15**								h
2.	Other contact hours (office hours, examination)	**4**		**2**								h
3.	**Total number of contact hours**	**36**										h
4.	**Number of ECTS credits for contact hours**	**1,4**										ECTS
5.	**Number of independent study hours**	**14**										h
6.	**Number of ECTS credits for independent study hours**	**0,6**										ECTS

7.	**Number of practical hours**	**25**		h
8.	**Number of ECTS credits for practical hours**	**1,0**		ECTS
9.	**Total study time**	**50**		h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**2**		ECTS

READING LIST

1. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT 1995.
2. Klimpel - Napawanie i natryskiwanie cieplne. WNT 2000.
3. Lawrowski Z.: Tribologia. Tarcie, zużycie i smarowanie. PWN, Warszawa 1993.
4. Hebda M., Wachal A.: Trybologia. WNT, Warszawa 1980.
5. Biestek T., Sękowski S.: Metody badań powłok metalowych. WNT 1973.
6. Lech Pawłowski - The science and engineering of thermal spray coatings – John Wiley & Sons, II ed. Chichester 2008.
7. Bach F.-W., Laarmann A., Wenz T.: Modern Surface Technology. Copyright © 2006 Wiley-VCH Verlag GmbH & Co. KGaA.
8. Schneider K.E., Belashenko V., Dratwiński M., Siegmann S., Zagorski A.: Thermal Spraying for Power Generation Components. WILLEY-VCH 2006.
9. Heimann R.: Plasma Spray Coating. VCH 2008.
10. Davis J.R., Davis & Associates: Handbook of Thermal Spray Technology: ASM International 2004.
11. Tadeusz Hejwowski: Nowoczesne powłoki nakładane cieplnie odporne na zużycie ścierne i erozyjne. Wydawnictwo Politechniki Lubelskiej 2013.
12. Magazines: Przegląd Spawalnictwa, Inżynieria Materiałowa, Mechanik, Laser Solutions, Lakiernik, *Surface and Coatings* Technology, International.Welding.